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The Effect of Free Rhythmic Aerobic Exercises in a Number of Functional, Biochemical and Physical Variables for Female Students of the College of Physical Education and Sports Sciences

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ABSTRACT— The aim of the research is to reveal the effect of free rhythmic aerobic exercises on a number of functional, biochemical, and physical variables for female students of the College of Physical Education and Sports Sciences and to compare the pre and post-measurements. The experimental method was used in a one-group design for its relevance to the nature of the research, and the research sample consisted of (19) female students from the third stage in the College of Physical Education and Sports Sciences for the academic year (2019-2020). They were chosen in a deliberate way, and their average height, weight, and age were (2.871 ± - 158.368) cm, (4.094 ± - 60.894) kg, and (1.025 ± - 22.052) years respectively. All-female students were subjected to the curriculum of free rhythmic aerobic exercises for (12) weeks. The continuous training method was used with a ripple training load (3:1), the functional, biochemical, and physical measurements were taken before the curriculum, and also the same measurements were taken after the curriculum. The pre and post-measurements were carried out at an ambient temperature between (23-24)°C and humidity ranging between (35 - 40%). The researchers used testing, measurement, and all available information as means and tools for data collection, as they used a set of medical and laboratory devices and tools. The following functional variables were studied: number of breaths, systolic blood pressure, and diastolic blood pressure. As well as the following biochemical variables: total cholesterol, triglycerides, HDL, and LDL. In addition to the physical variable is aerobic capacity. The data were processed statistically using the arithmetic mean, standard deviation, and t-test for related samples. The research concluded that the training curriculum led to positive, significant changes in the number of breathing times, systolic pressure, total cholesterol, triglycerides, HDL, LDL, and aerobic capacity. While it did not lead to any significant change in the value of diastolic blood pressure.

KEYWORDS: Rhythmic Aerobic Exercises, Blood Fats, Number of Breaths, Blood Pressure, Aerobic Capacity.

1. INTRODUCTION

There are many methods and tools used in the various training curricula or used to acquire functional and biochemical adaptations in healthy people, as well as those who are overweight or obese. As [8] indicated in the study "The effect of jumping rope on some forms of fat among obese women participating in fitness and health programs." The study found a significant decrease in (total cholesterol TC, VLDL, LDL, and triglycerides TG), and on the other hand, a significant increase in (HDL) occurred [8], 416-437). There is also a study by [7] entitled "The effect of accompanying musical rhythm on learning some motor skills on

the floor movement mat for physical education students at AL-Najah National University." Where this study concluded that accompanying the musical rhythm with the skillful performance gave better results than the field training only in raising and improving the level of performance of the basic movements for the floor movements mat [7], 142). In addition to the study of [1] entitled "The Effect of the Aerobic Approach on Some Immunological Blood Variables, lipids forms and Body Components among Participants in Fitness and Health Programs." Where this study reached results, and among its results are positive changes in the images of fat through the use of aerobic exercises on the sample members [1], 146). In the study [10]. "The Effects of Different Exercise Programmes on Female Body Composition," the study found a decrease in the level of fat in the woman's body and an improvement in anthropometric measurements during a period of (16) weeks [10], 74). From the foregoing, it is clear that all the curricula included in previous studies and research require tools, devices, and places designated for their performance that may not be available to everyone, or that it may be difficult for a section of people to go to these places, because of the connections to life, their work, and their jobs. Hence the importance of the research in the possibility of providing accurate scientific information about the use of these exercises by everyone to obtain positive results in terms of health and physical fitness without significant costs.

1.1 Research problem

By informing the researchers of the methods used for acquiring functional and biochemical adaptations, they found that most of them use expensive devices and tools, and require specific places to implement these used approaches. Therefore, this motivated the researchers to study the effect of free rhythmic aerobic exercises on a number of functional, biochemical, and physical variables for female students of the College of Physical Education and Sports Sciences. Moreover, It does not require expensive tools and can be performed anywhere the individual is.

1.2 Research objectives

1- Detecting the effect of free rhythmic aerobic exercises on the functional variables* for female students of the College of Physical Education and Sports Sciences.

2- Detecting the effect of free rhythmic aerobic exercises on the biochemical variables** for female students of the College of Physical Education and Sports Sciences.

3- Detecting the effect of free rhythmic aerobic exercises on the physical variables*** for female students of the College of Physical Education and Sports Sciences.

1.3 Research hypotheses

1- There are no significant differences in the functional variables between the pre-and post-test for female students of the College of Physical Education and Sports Sciences.

2- There are no significant differences in the biochemical variables between the pre and post-test for female students of the College of Physical Education and Sports Sciences.

3- There are no significant differences in the physical variables between the pre-and post-test for female students of the College of Physical Education and Sports Sciences.

1.4 Research limits

1- Human limits: This study has been applied to the third stage students of the Faculty of Physical Education and Sports Sciences.

2- Spatial limits: This study was carried out in the fitness hall of the College of Physical Education and Sports Sciences and Radwan Al-Jamas Laboratory for pathological analyzes.

3- Time limits: This study was carried out during the period from (30/11/2019) to (26/1/2020).

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2. Research procedures

2.1 Research methodology

To achieve the objectives of this study, the researchers used the experimental method for its convenience to the nature of the research.

2.2 Research sample

The research sample included the students of the third stage of the College of Physical Education and Sports Sciences, which numbered (24) students. Five students were excluded due to an injury that prevented them from communicating, so the total number became (19) students. The research sample was chosen in an intentional way, knowing that they were of a similar age. Table 1 presents clarifying information about the research sample.

Table (1) represents some clarifying information about the research sample.

Variables / **Statistical parameters**	Height (cm)	Weight (kg)	Chronological age (year)
Arithmetic mean	158.368	60.894	22.052
Standard deviation	2.871	4.094	1.025

2.3 Data collection

The researchers used tests, measurements, and scientific sources as means of collecting research data.

2.4 Devices and instruments used in research

- Blood lipid analyzer (Cobas C3III) Roche Hitachi German and Japanese origin.
- An electronic height and weight measuring device (Detecto), measures the lowest value (0.2) kg and it is the US in origin.
- A special container for storing blood samples and transporting them to the analysis laboratory (Cool Box), number (1).
- Plastic test tubes, the size of (5) ml, number (40).
- One plastic test tube holder.
- Plastic syringes, medical cotton, wound pads.
- Elastic link (torenca).
- Sterile materials (medical alcohol concentration level 60%) and distilled water.
- A mercury sphygmomanometer of Japanese origin.
- Stethoscope, made in Japan.
- An electronic stopwatch that measures to the nearest (1/100) second number (3) type (Diamond) of Japanese origin.
- Device (D.J).

2.5 Description of measurements and tests of this study

2.5.1 Description of functional measurements

2.5.1.1 Measuring the number of breathing times per minute

This measurement was made while the female student from the research sample was sitting on the chair, as the person in charge of the measurement process counts the number of times the chest rises (inhales) during

one minute [5], 185).

2.5.1.2 Measuring systolic and diastolic blood pressure

The measurement is made using a stethoscope and an ordinary mercury manometer (Sphygmomanometer) using the auscultatory method [23], 349-350).

2.5.1.3 Measurement of body height and weight

The heights of the research sample members were measured using a device (measurement of height and weight), as the sample member stands on the base of the device without shoes, and the person conducting the measurement process lowers a small metal plate onto the his head from the metal pole, and the number at which the indicator stands represents the height of the sample member in centimeters. As for measuring the weight, the sample member stands on the base of the device without shoes while wearing only sports pants. The reading is done after the electronic meter is fixed on a number that represents his weight in kilograms, and the device measures to the nearest (200 gm).

2.5.2 Description of biochemical measurements

2.5.2.1 Blood fats measurement

The enzymatic, colorimetric method of the Cobas C3III fats analyzer was used to calculate the levels of total cholesterol (TC), triglycerides (TG), HDL, and LDL.

2.5.3 Description of physical tests (aerobic capacity test)

Test name: Hood johnsonoscope test for aerobic capacity [4], 293-294).

2.6 The experimental design

The researchers used the experimental design (the experimental group design with pre- and post-test).

2.7 Field steps for conducting research

2.7.1 Preparation of physical exercise curriculums

After analysis of the content of scientific sources and identification of physical exercises, the proposed training curriculum and the (continuous) method of training are designed to be consistent with the age group of female players aged (19-23) years. The training curriculum included (36) training modules for the continuous training method and the curriculum took (12) weeks to implement and was distributed into three training modules each week (Sunday, Tuesday, and Thursday). Table (2) shows the training unit model for the first weekly course.

Table (2) The training unit model for the first weekly session (the first - second - third unit)

Exercises used	Exercise intensity	Exercise time	No. repetitions	Rest time between repetitions	No. groups	Total exercise time
Trot	75%	3 min	1	15 sec	1	3.15 min
Walk		3min	1	30 sec	1	3.30 min
Swedish exercises (to the rhythm of music)		25 min	2	30 min	1	80 min

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2.7.2 Exploratory Experiments

2.7.2.1 First exploratory experience

Researchers conducted a reconnaissance experiment on 30/10/2019 on the research sample to identify the difficulties and problems faced by students while performing tests and knowing which tests need to be modified and the researchers conducted aerobic capability tests.

2.7.3 Main research experience (31/10/2019) until (26/1/2020).

2.7.3.1 Pre-measurements

The pre-tests of the research sample were conducted before starting the implementation of the training curriculum on (31/10/2019) as follows:

- All measurements of the functional and biochemical variables under consideration were taken at rest, as the procedure was carried out after the sample sat for (20) consecutive minutes without any physical effort.
- The weights and lengths of the research sample were taken.
- The laboratory temperature was (23-24) degrees and the relative humidity (35-40%).
- The research data were recorded during the experiment in a form designed for that.

2.7.3.2 Implementation of the training curriculum

After conducting pre-measurements of the variables under study, the researchers implemented the training curriculum for the period from (3/11/2019) to (23/1/2020). The researchers took into account the following points in implementing the curriculum, which are:

- Start all training units with a general warm-up in order to prepare the general muscles of the body, and then move to a special warm-up for the muscles involved in the work.
- Implementation of the training curriculum took (12) weeks (12 mini courses).
- The training curriculum consisted of three intermediate cycles in which the load formation (3:1) was used in each intermediate cycle as in Figure (1) which show the movement of the load ripple of the training curriculum.
- Each small course included three training units conducted on the days (Sunday, Tuesday, and Thursday), so the training curriculum has included (36) training units.
- The continuous training method was adopted in all load minor cycles.
- All exercises are performed by all sample players (the exercises are performed with music).
- In legalizing the training load, researchers took into account the basic principles of sports training science in terms of controlling the level of training load in terms of the relationship between intensity and volume.
- Finish the training unit with muscle calming and relaxation exercises.

ad type	First Intermediate course				Second Intermediate Course				Third Intermediate Course			
	First week	Second week	Third week	Fourth week	Fifth week	week Sixth	Seventh week	Eighth week	Ninth week	Tenth week	Eleventh week	Tw h w
ximum												
semi-ximum load												

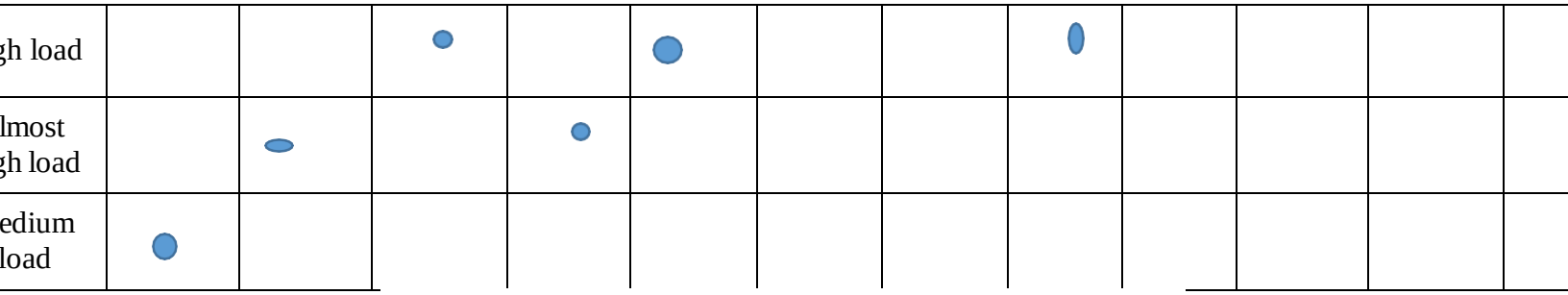

Figure (1): Shows the load ripple movement of the training curriculum

2.7.3.3 Post-measurements

After achievement of the training curriculum, dimensional measurements of the research sample were carried out for the period from (26/1/2020) as follows:

The same pre-measurements procedures were repeated, taking into account the same order of the sample members in the pre and post tests and in the same laboratory conditions.

2.8 Statistical Methods

The researchers used the following statistical methods:

1- Arithmetic mean.

2- Standard deviation.

3- t-test for related samples and the statistical package (SPSS) was used to treat the data statistically.

3. Results and Discussion

3.1 Results

Table (3): It shows the arithmetic means, standard deviations, the calculated (t) value, and the probability level for the functional, biochemical and physical variables before and after the training curriculum.

Statistical parameters / Variables	Unit of measurement	Pre- measurements		Post-measurements		Calculated (t) value	Probability level
		arithmetic means	standard deviations	arithmetic means	standard deviations		
Number of breaths	one/minute	18.894	3.413	16.157	2.141	3.819	0.001*
Systolic pressure	mm Hg	117.368	6.533	111.052	9.365	2.882	0.010*
Diastolic pressure	mm Hg	78.947	4.588	75.263	7.723	1.681	0.110
Total Cholesterol	Mg/dl	184.300	33.863	167.421	30.460	4.561	0.000*
Triglycerides	Mg/dl	74.578	29.430	57.590	16.107	2.600	0.018*
HDL	Mg/dl	51.894	8.774	54.894	7.302	-3.865	0.001*

LDL	Mg/dl	117.489	32.582	101.008	29.997	3.781	0.001*
Aerobic capacity	watt	36.263	7.308	58.311	7.802	9.606	0.000*

* Significant at an error rate of ≤ (0.05), in front of a degree of freedom = 18

3.2 Discussion of the results

In light of the results obtained regarding the number of number of breathing times, systolic pressure, diastolic pressure, total cholesterol, triglycerides, HDL, LDL, aerobic capacity, and through Table (3), we note that there are significant differences between the pre and post tests for each of the variables number of breathing times, systolic pressure, total cholesterol, triglycerides, HDL, LDL, and aerobic capacity, in favor of the post test. While there were no significant differences between the pre and post tests for the diastolic blood pressure variable. The researchers attribute the reason for these results to the following:

- In general, the nature of the vocabulary of the training curriculum consisting of free rhythmic aerobic exercises accompanying the sound of music because of its positive impact on the psychological state in the continuation and completion of the exercises, which lasted for (12) weeks, it is the main factor in the occurrence of all the changes that occurred to moral variables under study.
- With regard to the variable of number of breathing times (RR), we note a significant decrease in favor of the post test. The reason may be due to the adaptations made by the training curriculum from as the economy in the number of breathing times through the increase in the breathing process during the performance of free rhythmic exercises for a period of (12) weeks. This was confirmed by [15] that "the breathing rate can be adapted to exercise to increase its efficiency, and in general, the basic ability to breathe increases during extreme exercises" [15]. [9] mentioned "The breathing rate increases during exercise in order to regulate (blood pH), which decreases as a result of exercising these exercises by exposing (CO_2)" [9]. On the other hand, perhaps the effect of the hormone epinephrine, which increases the number of breathing times during exercise, because it's circulating levels in the blood rise during exercise and decrease during rest. This stated [12], that the effect of the adrenal hormone epinephrine released from the adrenal medulla, which in turn leads to an increase in the breathing rate, also stimulates the increase in pulmonary ventilation. This in turn, leads to an increase in the breathing rate. The levels of circulating epinephrine in the blood rise during exercise for the flow of nerve signals from the sympathetic system that accompanies physical activity [12].
- With regard to the systolic pressure (SP) variable, we notice a significant decrease in favor of the post test, the reason may be due to the regularity in training and to the increase in the level of functional adaptation and then the increase in energy requirements during the application of the curriculum, as evidenced by the improvement in the results of the post test, which led to a decrease in the value of systolic pressure and this He agrees with [2] that "the adaptation that occurred in increasing the control of pressure receptors (Baroreceptors) located in the carotid artery and aorta, which monitors the state of change in the body's need for blood through the intensity of effort, on the basis of which it sends commands to the brain and to the center of Cardiovascular Control Center states that the body needs a certain amount of blood to the working muscles as much as the body needs blood. [2]. Or perhaps because it is related to an arithmetic relationship with cardiac output and vascular resistance, meaning that (blood pressure = cardiac output x vascular resistance), the higher the cardiac output or vascular resistance, the higher the systolic blood pressure and vice versa, and the changes that occur to systolic blood pressure as a sports condition are to meet the body's need for oxygen during exercise, which makes it more related to cardiac output at the expense of vascular resistance in moderate thermal conditions, which consists of heart rate and stroke volume of blood, as mentioned [13]. that "any increase in the heart rate and its contraction increases the systolic blood pressure, and on the contrary, any decrease will lower the systolic blood pressure." [13].

- As for the total cholesterol variable (TC), we notice a significant decrease in favor of the post-test, perhaps due to what was agreed upon [1] quoting from [21], [16] that total cholesterol in the plasma decreases significantly as a result of the daily routine movement and this change coincides with the use of a low to medium intensity aerobic training program for a period of (12) weeks at a rate of (3) training units per week, and the reason is also due in agreement with [22] to an increase in the morale of high-density lipoproteins. (HDL) As a result of the implemented aerobic program, and the benefit of (HDL) is to collect total cholesterol from the arteries and transport it to the liver in order to get rid of it and remove it. (Ausi, 2005, 96) [21], [16], [22].
- As for the triglyceride variable (TG), we also note a significant decrease in favor of the post test, which may be due to the aerobic exercises used in the structured training curriculum have positive effects in the process of reducing triglyceride levels (TG) in the blood, and this is what was agreed upon by the results of the study [18] which found a significant decrease in the concentration of triglycerides (TG) in the blood through the sports curriculum used over a period of (8) weeks. [18]. Or, the reason for the low concentration of triglycerides (TG) in the blood may be due to a decrease in the hormone insulin due to the adaptations that occurred through rhythmic aerobic exercises in the training curriculum over a period of (12) weeks. [14] mentioned that insulin works to form large quantities of alpha-glycerol phosphate, as this substance works to prepare (glycerol) that combines with fatty acids to form triglycerides (TG), which is the form in which fat is stored in fat cells. Therefore, when there is not enough insulin, the large amounts of fatty acids that are secreted from the liver are used to prepare the aerobic energy in the mitochondria. This happens in the absence of insulin [14]. As well as stated [1] in agreement with [11] that exercise in general leads to a decrease in the concentration of triglycerides (TG) in the blood, and the reason is due to a decrease in the hormone insulin. [1], [11]. In addition to that, [25] also mentioned) “Insulin helps to transfer glucose from the blood to the cells in the event of a high level of glucose in the blood, and after sufficiency, carbohydrates are converted into fats, and this in turn can raise the concentration of triglycerides (TG). and total cholesterol in the blood. [25].
- As for the high-density lipoprotein variable (HDL), we notice a significant increase in the values and in favor of the post-test, the reason may be due to the fact that exercise in general and aerobic exercise in particular raise the level of HDL which leads to the improvement of the health and physical condition of the person. This was confirmed by [17] in an illustrative example showing that "regular aerobic exercise for women with moderately low levels of HDL, overall, led to a (27%) increase in HDL. [17], [24] also stated that stretching exercises lead to a relatively large increase in the level of HDL. Used in the training curriculum, as the HDL variable is associated with the TG variable in an inverse relationship, the higher the LDH, the lower the TG concentration and vice versa. Whereas [17] confirmed that exercise led to an increase in the levels of high-density lipoproteins (LDH) by (20-30%), in contrast to the concentration of triglycerides (TG), whose levels decreased from the value of the exercise training. [17]. As confirmed by [1] quoting [22] from (Lopez, etal, 1974) “They found an increase in high-density lipoproteins (LDH) with a decrease in the concentration of triglycerides (TG) as a result of exercise for a period of (7) weeks. [1], 101) [22].
- As for the low-density lipoprotein variable (LDL): we note a significant decrease in LDL in favor of the post test, the reason may be due to an increase in the levels of high-density lipoproteins LDH and this was confirmed by the results of the study, which in turn leads to the collection of LDL from the body and transported to the liver to be removed by metabolic processes, which leads to its decrease this was confirmed by [17]. "The increase in the levels of high-density lipoproteins (LDH) through aerobic exercise led to a decrease in the levels of LDL." [17]. also confirmed that diet alone without exercise is not sufficient in the process of reducing LDL levels. In the same context, [20] also mentioned that “there was a decrease in the levels of LDL after three days of exercise, which was reduced to LDH. In addition, exercise activates the LCAT, which feeds LDH molecules.” [20], 208. This is also in agreement with [19] “Exercise increases

the level of high-density lipoproteins (LDH), which lowers LDL levels by Removed from the arterial walls and transferred to the liver. [19].

- As for the aerobic capacity variable, we notice a significant increase in favor of the post-test, the reason may be mainly due to the improvement in the work of the circulatory and respiratory systems, which is the result of following the correct scientific foundations in the development and design of the training curriculum, which has contributed to this development of aerobic capabilities. From the researchers' point of view, the development that occurred was the result of the use of physical exercises accompanied by rhythm of intensity commensurate with performance, this is consistent with what was explained by [6]. "The intensity of exercise commensurate with rest times from one unit to another achieves the development of functional capabilities through the physiological adaptation of the players." [6], [3] stated, “Regular training will lead to physiological changes in all functions of the body’s systems, especially the heart and blood circulation. Athletes can adapt to physiological changes that occur in the body’s organs during muscular effort and continue to perform This effort and these changes include the number of heartbeats and the number of breathing times.” [3].

4. Conclusions and recommendations

4.1 Conclusions

1. Free rhythmic aerobic exercise induced a positive change in the functional variables, which included both respiratory rate (RR) and systolic blood pressure (SP).
2. Free rhythmic aerobic exercise induced a positive change in biochemical parameters, which included total cholesterol (TC), triglycerides (TG), high-density lipoproteins (HDL), and low-density lipoproteins (LDL).
3. Free rhythmic aerobic exercise caused a positive change in the physical variables, which included both aerobic capacity.
4. Free rhythmic aerobic exercise did not cause any change in the diastolic blood pressure (DP) variable.

4.2 Recommendations

1. It is possible to use free rhythmic aerobic exercises without being restricted to special places or specific times.
2. Conducting other research studies of the effect of free rhythmic aerobic exercises on other physiological variables, and even psychological variables can be studied as well.
3. Maintaining general health, fitness and harmonious body through the use of the exercises under study.
4. Follow up on the type of daily food intake and reduce the items that lead to the accumulation of harmful lipids in the bloodstream and thus lead to vascular problems.

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